

IN THE CLAIMS

Upon entry of the present amendment, the status of the claims will be as is shown below. The present listing of claims replaces all previous versions and listings of claims in this application.

Claims 1-18 (Cancelled)

19. (New) A servo drive system of a press machine, comprising:

a ram;

an operation shaft which vertically moves the ram;

a pair of servo motors which are formed symmetric to each other at opposite ends of the operation shaft, which operate as power sources of the ram, and which composite torques based in common on at least one speed-torque characteristic to generate ram pressure,

a servo amplifier of one of the pair of servo motors, comprising a power unit; and

a servo amplifier of the other of the pair of servo motors, comprising a power unit,

wherein the pair of servo motors are operated integrally so that the pair of servo motors directly drive the operation shaft to vertically move the ram, and

wherein the power unit of the servo amplifier of the one of the pair of servo motors and the power unit of the servo amplifier of the other of the pair of servo motor are driven by a common gate signal to integrally operate both of the pair of servo motors.

20. (New) The servo drive system according to claim 19,

wherein the pair of servo motors use a torque based on speed-torque characteristics of a motor, and

wherein, if a load is received from a work during a process of lowering the ram to generate ram pressure without utilizing inertia of a mechanism, speeds of both the pair of servo motors are reduced according to the load, thereby reducing a lowering speed of the ram.

21. (New) The servo drive system according to claim 19,

wherein the operation shaft comprises an eccentric shaft formed as a motor main shaft.

22. (New) The servo drive system according to claim 21, further comprising:

a left extension of the eccentric shaft;

a right extension of the eccentric shaft;

a first sleeve, fitted over a periphery of the left extension of the eccentric shaft and provided at an outer periphery with an even number of magnetic pole magnets along a circumferential direction at predetermined distances from one another,

a second sleeve, fitted over a periphery of the right extension of the eccentric shaft and provided at an outer periphery with an even number of magnetic pole magnets along a circumferential direction at predetermined distances from one another,

wherein the first sleeve and the second sleeve form rotors of the pair of servo motors,

wherein magnetic pole positions of the left sleeve and the right sleeve are positioned such that the sleeves are symmetric with each other;

wherein the first sleeve and the second sleeve are fixed by bushes,

wherein stators of the pair of servo motors have outer cylinders fitted over the rotors;

wherein three-phase armature windings are wound around the outer cylinders, and

wherein left and right outer cylinders are positioned such that positions of the three-phase armature windings of the outer cylinders in the circumferential direction are symmetric with each other, and the outer cylinders are fixed to left and right supporting frames of the eccentric shaft.

23. (New) The servo drive system according to claim 21, further comprising:

a left extension of the eccentric shaft;

a right extension of the eccentric shaft;

a first sleeve, fitted over a periphery of the left extension of the eccentric shaft and provided at an outer periphery with an even number of magnetic pole magnets along a circumferential direction thereof at predetermined distances from one another;

a second sleeve, fitted over a periphery of the right extension of the eccentric shaft and provided at an outer periphery with an even number of magnetic pole magnets along a circumferential direction thereof at predetermined distances from one another;

wherein the first sleeve and the second sleeve form rotors of the pair of servo motors,

wherein magnetic pole magnets of the left sleeve and the right sleeve are positioned in a circumferential position such that the sleeves are symmetric with each other,

wherein the first sleeve and the sleeves are fixed by bushes,

wherein stators of the pair of servo motors have outer cylinders fitted over the rotors;

wherein three-phase armature windings are wound around the outer cylinders, and

wherein left and right outer cylinders are positioned such that positions of the three-phase armature windings of the outer cylinders in the circumferential direction are symmetric with each other, and the outer cylinders are fixed to left and right supporting frames of the eccentric shaft.

24. (New) A servo drive system of a press machine, comprising:

a servo motor which operates as a driving source of a ram,

wherein the servo motor uses a torque based on speed-torque characteristics of a motor,

wherein ram pressure is generated without utilizing inertia of a mechanism,

wherein, if a load is received from a work during a process of lowering the ram, motor speed is reduced according to the load, thereby reducing a lowering speed of the ram, and

wherein the servo motor directly drives an operation shaft which vertically moves the ram.

25. (New) The servo drive system according to claim 24,

wherein the operation shaft comprises an eccentric shaft formed as a motor main shaft.

26. (New) A servo drive system of a press machine, comprising:

a ram;

an operation shaft which vertically moves the ram; and

a pair of servo motors which are opposed to each other at opposite ends of the operation shaft, and which operate as driving sources of the ram;

wherein the servo motors composite torques based in common on at least one speed-torque characteristic to generate ram pressure,

wherein ram pressure is generated without utilizing inertia of a mechanism,

wherein, if a load is received from a work during a process of lowering the ram, motor speed is reduced according to the load, thereby reducing a lowering speed of the ram, and

wherein the pair of servo motors are integrally operated, thereby directly driving the operation shaft.

27. (New) The servo drive system according to claim 26,  
wherein the operation shaft comprises an eccentric shaft formed as a motor main shaft.

28. (New) A continuous working system of a press machine, comprising:  
a ram;  
an operation shaft which vertically moves the ram; and  
a servo motor which operates as a power source of the ram and which generates ram pressure  
using a torque based on speed-torque characteristics of a motor,  
wherein the operation shaft is directly driven using the servo motor, and  
wherein the operation shaft is continuously reciprocated and turned through an angle range  
corresponding to a distance between a predetermined lower end position required for press working  
by the ram and a position where the ram is returned from the lower end position and a lower end of  
the ram is separated from a tool upper surface such that the ram vertically moves between these  
positions by the servo motor, thereby subjecting a work to a continuous press working.

29. (New) The continuous working system according to claim 28,  
wherein the servo motor uses a torque based on speed-torque characteristics of the motor, and  
wherein the servo motor generate ram pressure without utilizing inertia of a mechanism.

30. (New) The continuous working system according to claim 28,  
wherein the operation shaft comprises an eccentric shaft formed as a motor main shaft.

31. (New) A continuous working system of a press machine, comprising:

a ram;

an operation shaft which vertically moves the ram; and

a pair of servo motors which operate as power sources of the ram, which are opposed to each other at opposite ends of the operation shaft, and which composite torques based in common on at least one speed-torque characteristic to generate ram pressure,

wherein the operation shaft is directly driven using the pair of servo motors, and

wherein the operation shaft is continuously reciprocated and turned through an angle range corresponding to a distance between a predetermined lower end position required for press working by the ram and a position where the ram is returned from the lower end position and a lower end of the ram is separated from a tool upper surface such that the ram vertically moves between these positions by the pair of servo motors, thereby subjecting a work to a continuous press working.

32. (New) The continuous working system according to claim 31,

wherein the servo motors use a torque based on speed-torque characteristics of the motor,

and

wherein the servo motors generate ram pressure without utilizing inertia of a mechanism.

33. (New) The continuous working system according to claim 31,

wherein the operation shaft comprises an eccentric shaft formed as a motor main shaft.

34. (New) A servo drive system of a punch press, comprising:

a ram;

an operation shaft which vertically moves the ram; and  
a servo motor which operates as a power source of the ram and which generates ram pressure using a torque based on speed-torque characteristics of a motor,  
wherein the operation shaft is directly driven using the servo motor, and  
wherein the servo motor has a control power driver with a front stage at which is provided a reactor which suppresses peak current by cutting off high frequency current component, and a capacitor which supplies electric energy which becomes short due to suppression of the peak current.

35. (New) The servo drive system of a punch press according to claim 34,  
wherein the capacitor supplies at least one of high speed operation electric energy and punching out electric energy which become short due to suppression of the peak current.